Appendix F.3:
Ice Storm

Vulnerability Assessment Parameters, Methodology and Results

The ice storm hazard vulnerability assessment of State-owned buildings and critical facilities in Louisiana involved an analysis of the number of recorded ice storms within each parish based on data provided by the National Climactic Data Center (NCDC) between 1993 and the present.

Based on this information, a hazard vulnerability assessment level (low, medium or high) was assigned for each of the State-owned buildings and critical facilities. The three hazard vulnerability levels are defined below.

- Low Hazard Vulnerability: Structures located in parishes with no recorded ice storms.
- Medium Hazard Vulnerability: Structures located in parishes with 1 to 4 recorded ice storms.
- High Hazard Vulnerability: Structures located in parishes with more than 4 recorded ice storms.

Map 4-7, Hazard Profile – Ice Storms, shows the number of recorded ice storms for each parish in the State of Louisiana based on NCDC data. Map F-44 indicates the location of State-owned critical facilities (ranked from low to high criticality) in Louisiana in relation to the number of ice storms.

Map F-45 shows State-owned critical facilities by level of vulnerability to the ice storm hazard.

Loss Estimate Parameters and Methodology

The ice storm loss estimate of State-owned buildings and critical facilities in Louisiana involved an analysis of the parameters described below.

- Ice Storm Hazard Vulnerability: As stated above, ice storm hazard vulnerability assessments involved an analysis of the number of recorded ice storms within each parish based on data provided by the NCDC between 1993 and the present. Low, medium and high vulnerability for ice storm are defined above.
- Average Building Type: Although the building types for each structure were described in the statewide GIS database, an analysis of all building types for individual State-owned buildings and critical facilities was beyond the scope of this loss estimate. Therefore, in order to conduct basic analyses, individual loss estimates assumed a single building type for each ice storm hazard vulnerability level based on experience with typical ice storm damages and building construction in Louisiana.
- Ice Storm Damage Functions (ISDFs): Physical (building) damage, contents damage and LOF costs for each hazard vulnerability level were estimated based on a series of ISDFs. These ISDFs were developed based on experience with ice storm damages in Louisiana and similar geographic areas.

  The ISDFs for building damage, contents damage and LOF used for the ice storm loss estimates are summarized in Table F.3-1.

Table F.3-1

Hazard Vulnerability Level	Building ISDF	Contents ISDF	LOF (days)
Low	0	0	0
Medium	Varies (see Notes)	0	1
High	Varies (see Notes)	0	3

NOTES: 1.) Assume building ISDF values as a function of the building footprint based on the following formulas:
For Medium Hazard Vulnerability Level - assume gutters are 50% damaged ($5/LF repair cost).
Building Damage = 4x$5x[(Building Area)/(No. of Stories)]^0.5
For High Hazard Vulnerability Level - assume gutters are 50% damaged ($10/LF repair cost).
Building Damage = 4x$10x[(Building Area)/(No. of Stories)]^0.5
2.) Assume zero contents damages from ice storms.
3.) Assume LOF values based on experience with ice storms in Louisiana and similar geographic areas.

- Physical Damage: For ice storms, physical damages were estimated as a function of the building footprint area. For each structure, the square root of the building footprint area was multiplied by 4 to arrive at an estimated building perimeter length. This building perimeter length was used to estimate the physical damages for each of the hazard vulnerability levels as shown below.
  - For low hazard vulnerability structures, assume zero physical damages.
  - For medium hazard vulnerability structures, assume physical damages are the estimated building perimeter length x $5/LF for gutter repairs (50% damage).
  - For high hazard vulnerability structures, assume physical damages are the estimated building perimeter length x $10/LF for gutter repairs (100% damage).
- Contents Damage: Contents damages were estimated to be zero for all ice storm hazard vulnerability levels in Louisiana.
- LOF: LOF costs were estimated as a proportion of the annual operating budget for each structure. The annual operating budgets for each facility were determined as a proportion of the current annual operating budget for the State of Louisiana. This annual operating budget, currently estimated at approximately $16.0 billion, was distributed to individual State-owned buildings and critical facilities based on the *factored square footage* of each structure. The factored square footage for each structure was determined by multiplying the actual square footage by a CF based on the criticality of each structure. A summary of CFs for all structures in Louisiana is provided in Table F.12. Note that by applying the CF to the square footage of each structure, it allows higher criticality facilities (such as fire stations) to obtain a larger proportion of the statewide annual budget, thereby increasing their annual budget values and LOF costs to reflect their importance. Once the annual operating budget was obtained for each structure, the LOF costs were computed by dividing the annual operating budget by 365 (to convert the annual budget to a daily budget) and multiplying by the corresponding ISDF for LOF (measured in days).

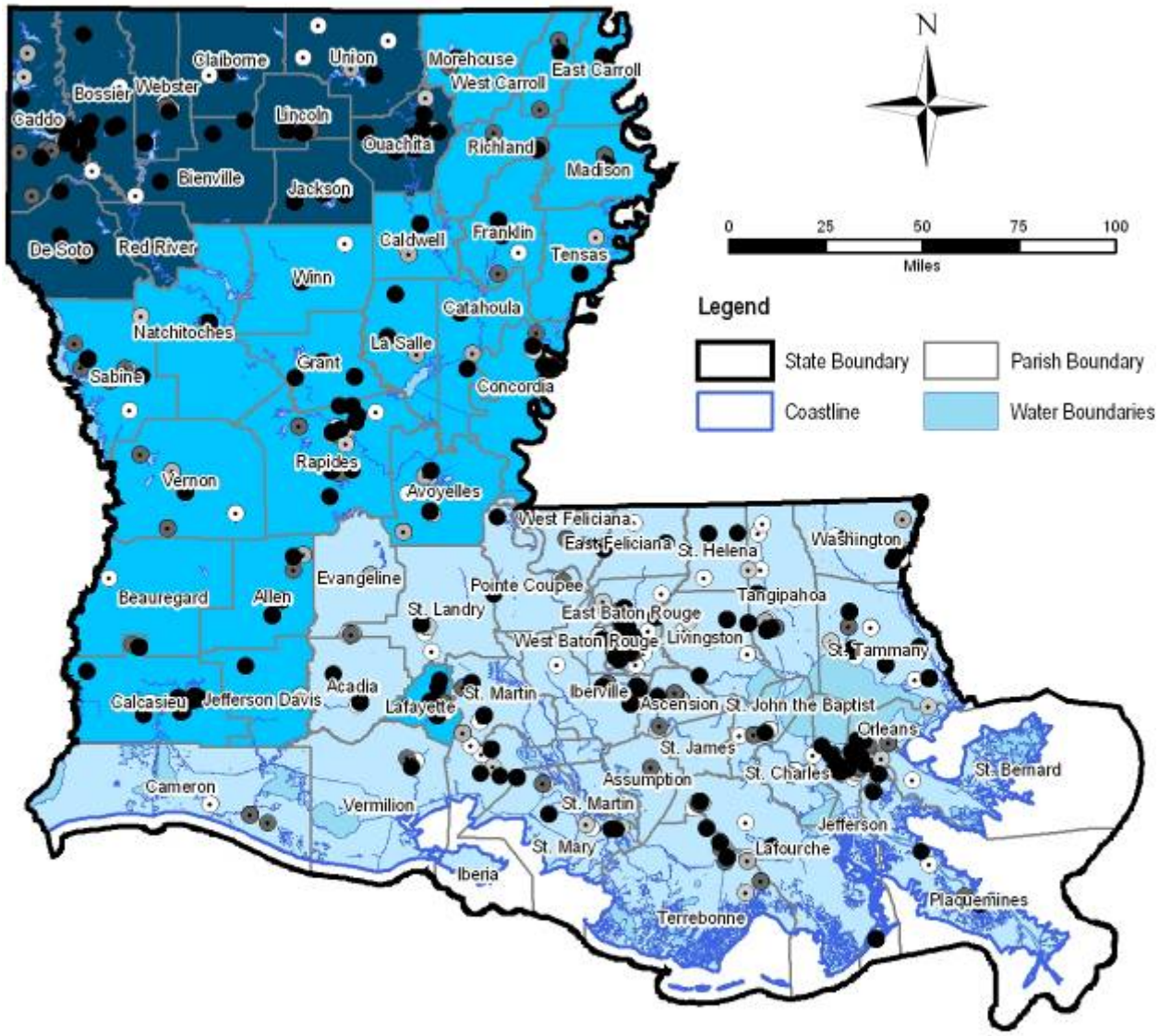
The critical facilities in Louisiana with highest physical damage and LOF costs for ice storms are presented in Maps F-46 and F-47 respectively. Map F-48 (also Map 6-6) presents the results of the ice storm loss estimate computations. The ten critical facilities in Louisiana with the highest combined loss estimates for the ice storm hazard are shown on Map F-49 (also Map 6-6) and are summarized in Table 6-12. State-owned critical facilities for each agency in Louisiana with the highest combined loss estimates for the ice storm hazard are presented in Maps F-50 thru F-60.

List of Assumptions

The ice storm loss estimate is based on the following assumptions.

- General: Loss estimates for individual structures are based on the number of ice storms that typically occur in a given area. Note that the assigning of numerical values and factors for loss estimate parameters is often qualitative in nature and based on data from a number of sources with varying degrees of accuracy. For this reason, ice storm loss estimates for individual structures should not be used for estimating property insurance coverage or other needs that require a high degree of accuracy.
- Ice Storm Hazard Vulnerability: Structures located in low hazard vulnerability areas will experience no ice storm damages. Structures located in medium hazard vulnerability areas will experience light to moderate damages. Structures located in high hazard vulnerability areas will experience moderate to heavy damages.
- Average Building Type and ISDFs: The physical and contents damages to individual State-owned buildings and critical facilities from ice storm will be considered the same for all buildings depending on the ice storm hazard vulnerability level. Differences in building type will not have an impact on typical ice storm damages such as damages to gutters and storm-related functional downtime (LOF).
- Physical Damage: For each structure, the BRV is consistent with the building values obtained from the statewide GIS database. In the event the statewide GIS database did not provide a BRV for an individual structure, the BRV was estimated to be zero. For each structure, the only physical damages are damage to gutters along the building perimeter, depending on the ice storm hazard vulnerability level.
- Contents Damage: For each structure, the contents replacement value is considered zero. The climate of Louisiana does not produce ice storms of the intensity and duration necessary to collapse building roofs resulting in contents damage.
- LOF: The $16.0 billion current annual operating budget for the State of Louisiana is distributed among all State-owned buildings and critical facilities in the statewide GIS database based on the factored square footage of each structure. In the event the statewide GIS database did not provide a square footage and/or criticality level for an individual structure, that square footage and/or criticality level was estimated based on the average square footage and/or criticality level for all structures in the statewide GIS database with available data. The CFs were derived based loosely on FEMA's *What is a Benefit?* draft guidance document dated May 1, 2001 and engineering judgment.

Map F-44: Location of Critical Facilities - Ice Storms



State-Owned Critical Facilities

1 (High) 2 (Medium-High) 3 (Medium) 4 (Medium-Low) 5 (Low)

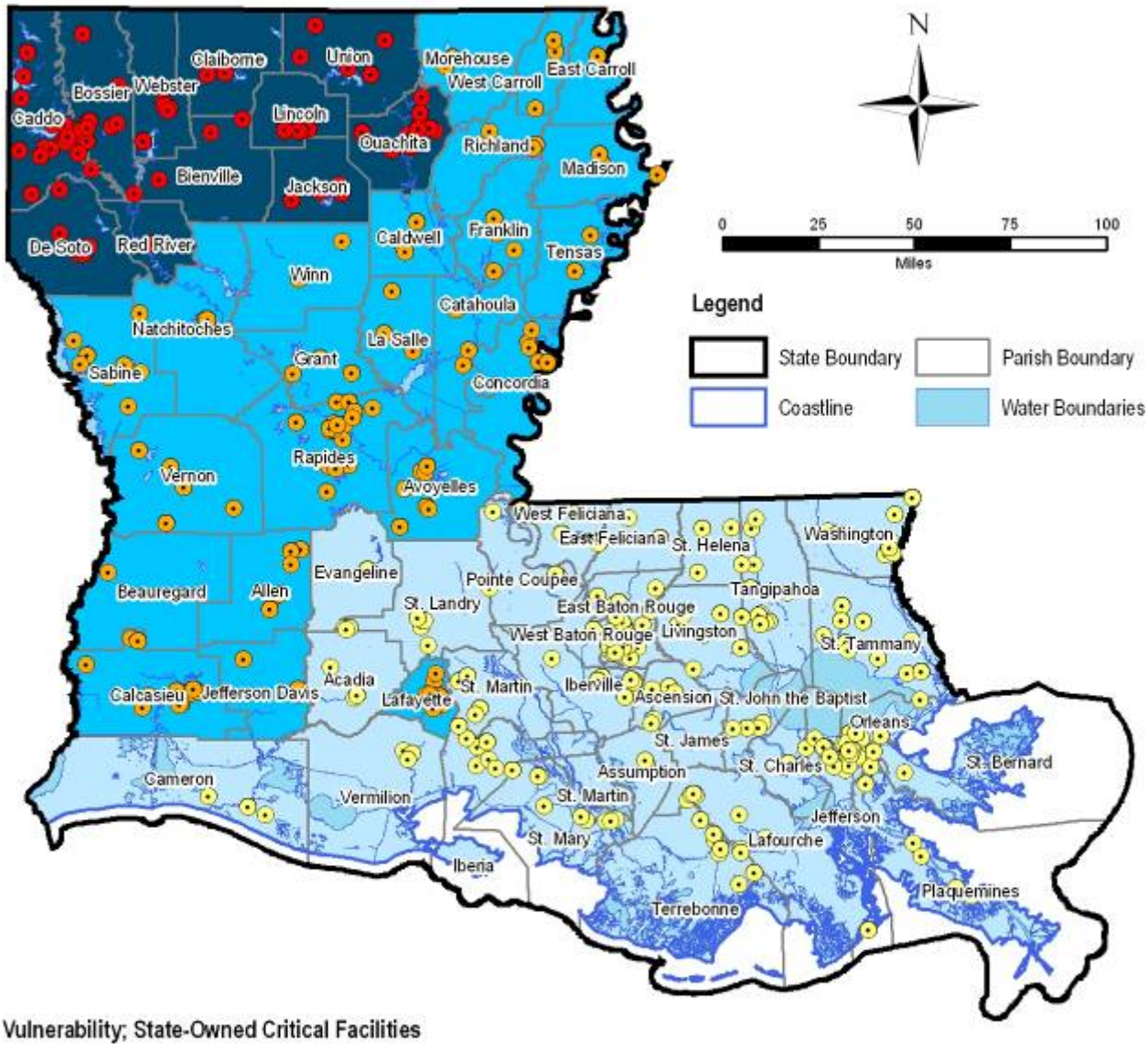
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms 1 - 4 Storms 5 - 10 Storms

Source: NOAA

Map F-45: Vulnerability Assessment - Ice Storms



Vulnerability; State-Owned Critical Facilities

High (17% of Total) Medium (30% of Total) Low (53% of Total)

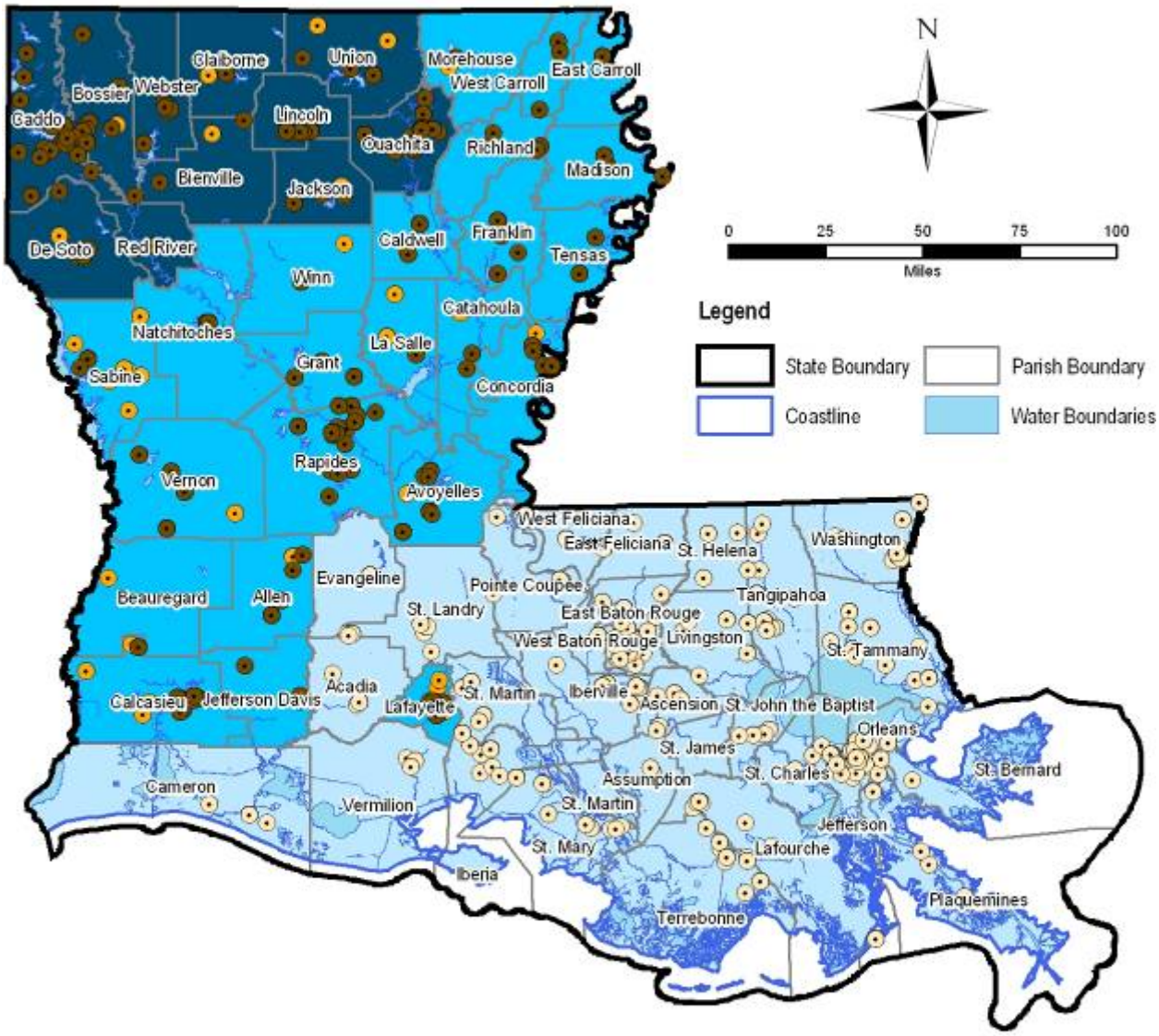
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms 1 - 4 Storms 5 - 10 Storms

Source: NOAA

Map F-46: Loss Estimate - Ice Storms - Physical Damage



Estimated Losses

Low: $0 Medium: $1 - $750 High: $751 - $10,500

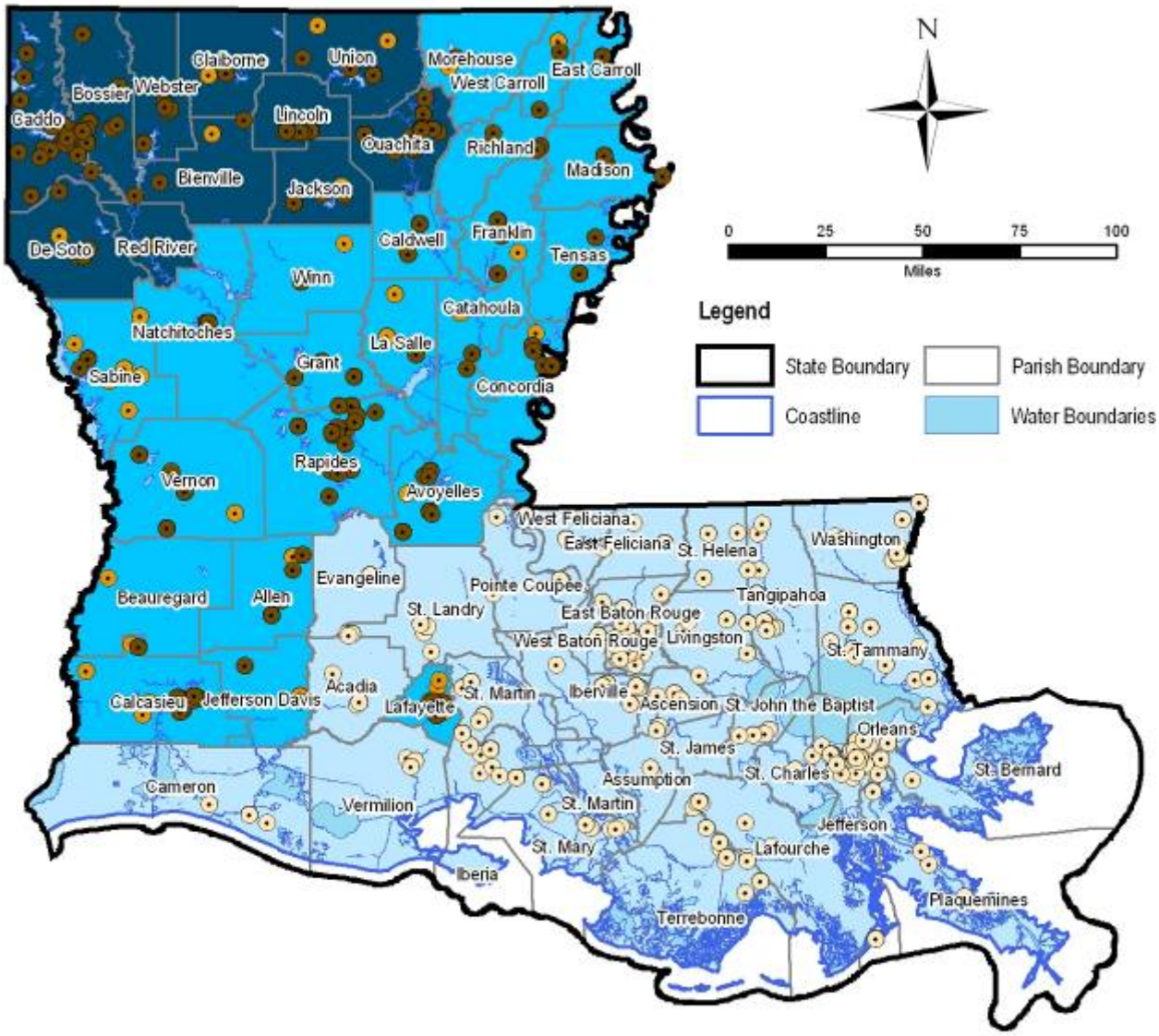
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms 1 - 4 Storms 5 - 10 Storms

Source: NOAA

Map F-47: Loss Estimate - Ice Storms - Function



Estimated Losses

Low: $0 Medium: $1 - $750 High: $751 - $2,000,000

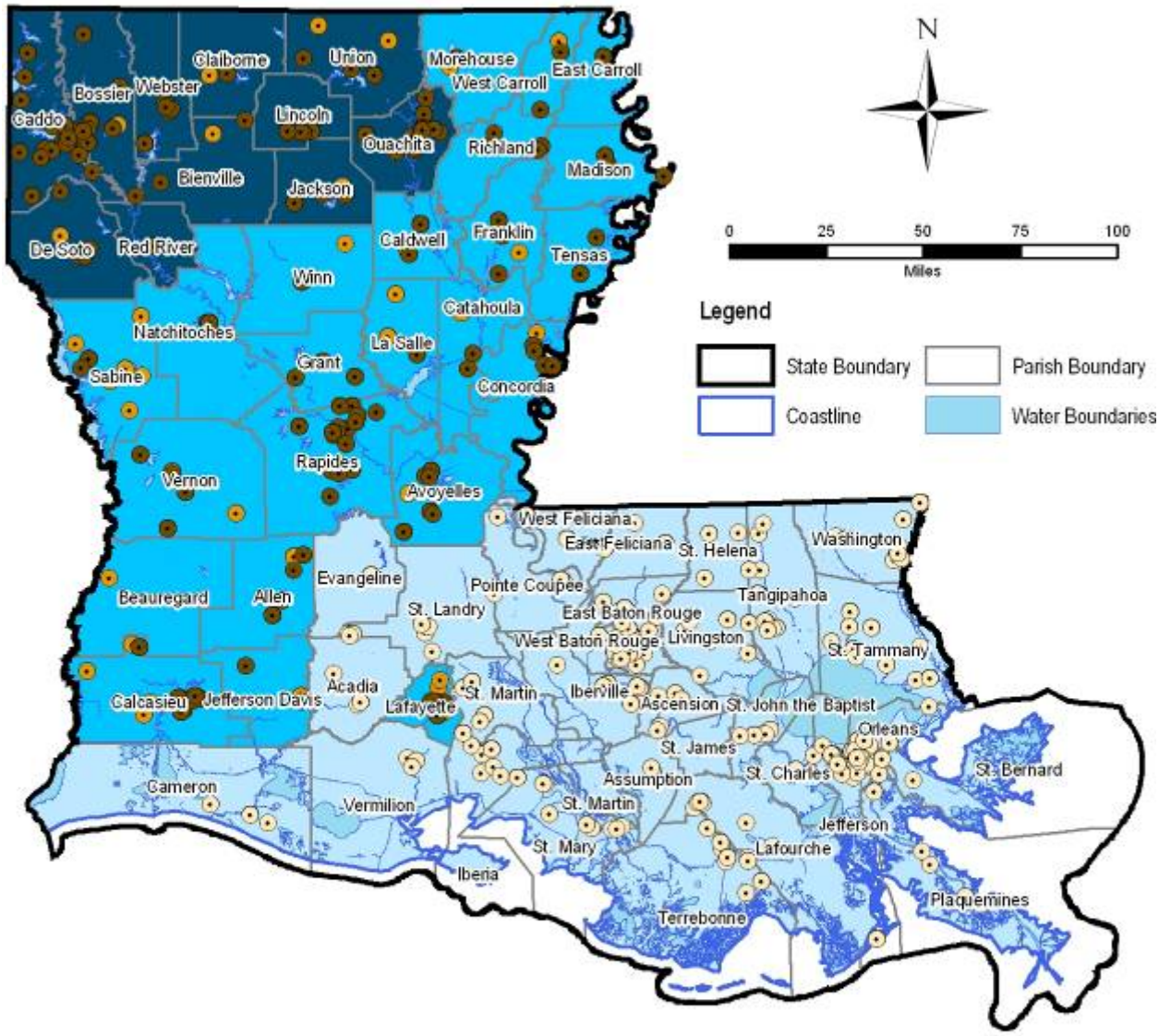
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms 1 - 4 Storms 5 - 10 Storms

Source: NOAA

Map F-48: Loss Estimate - Ice Storms - Total



Estimated Losses

Low: $0 Medium: $1 - $1,500 High: $1,501 - $2,000,0000

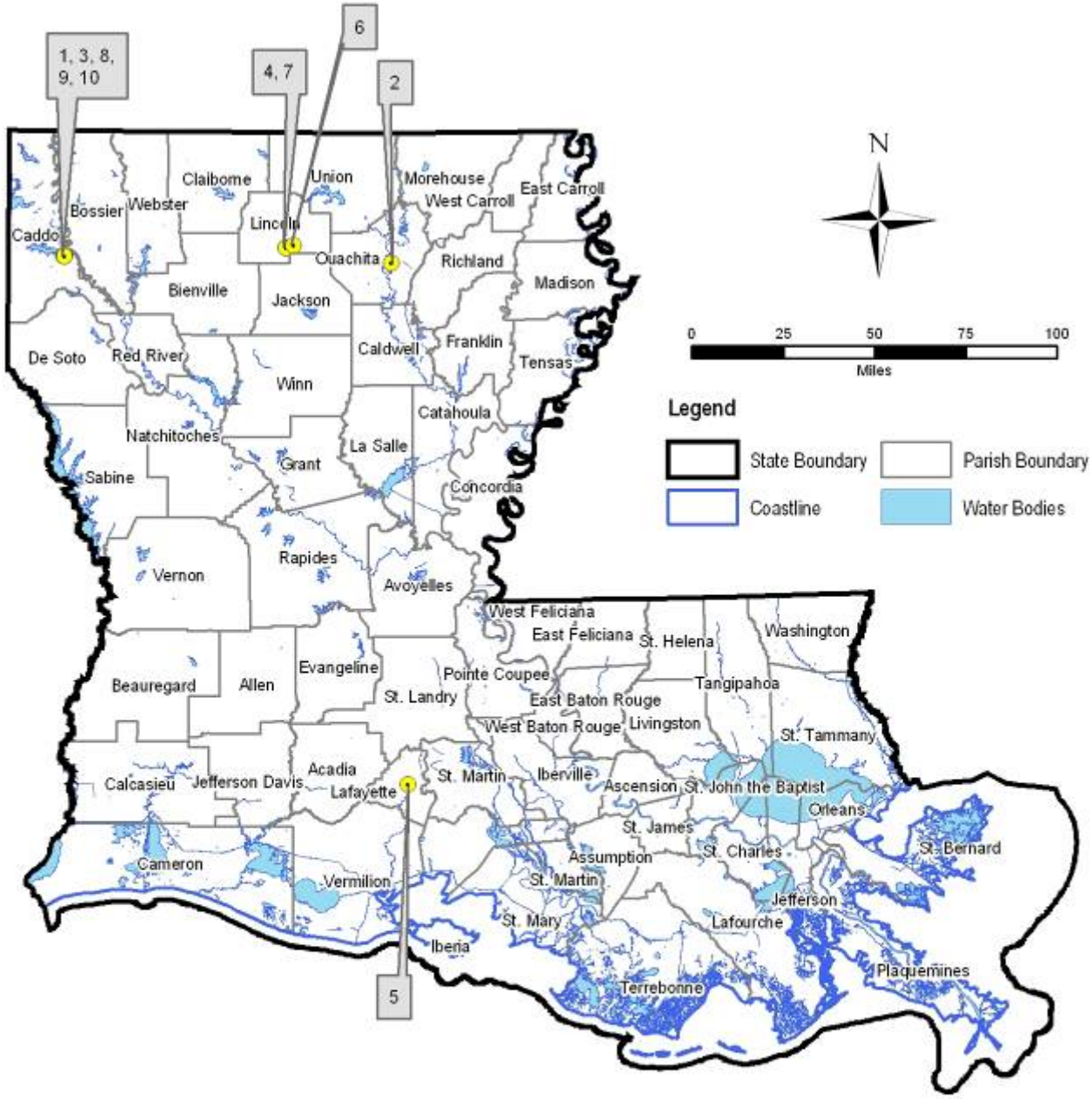
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms 1 - 4 Storms 5 - 10 Storms

Source: NOAA

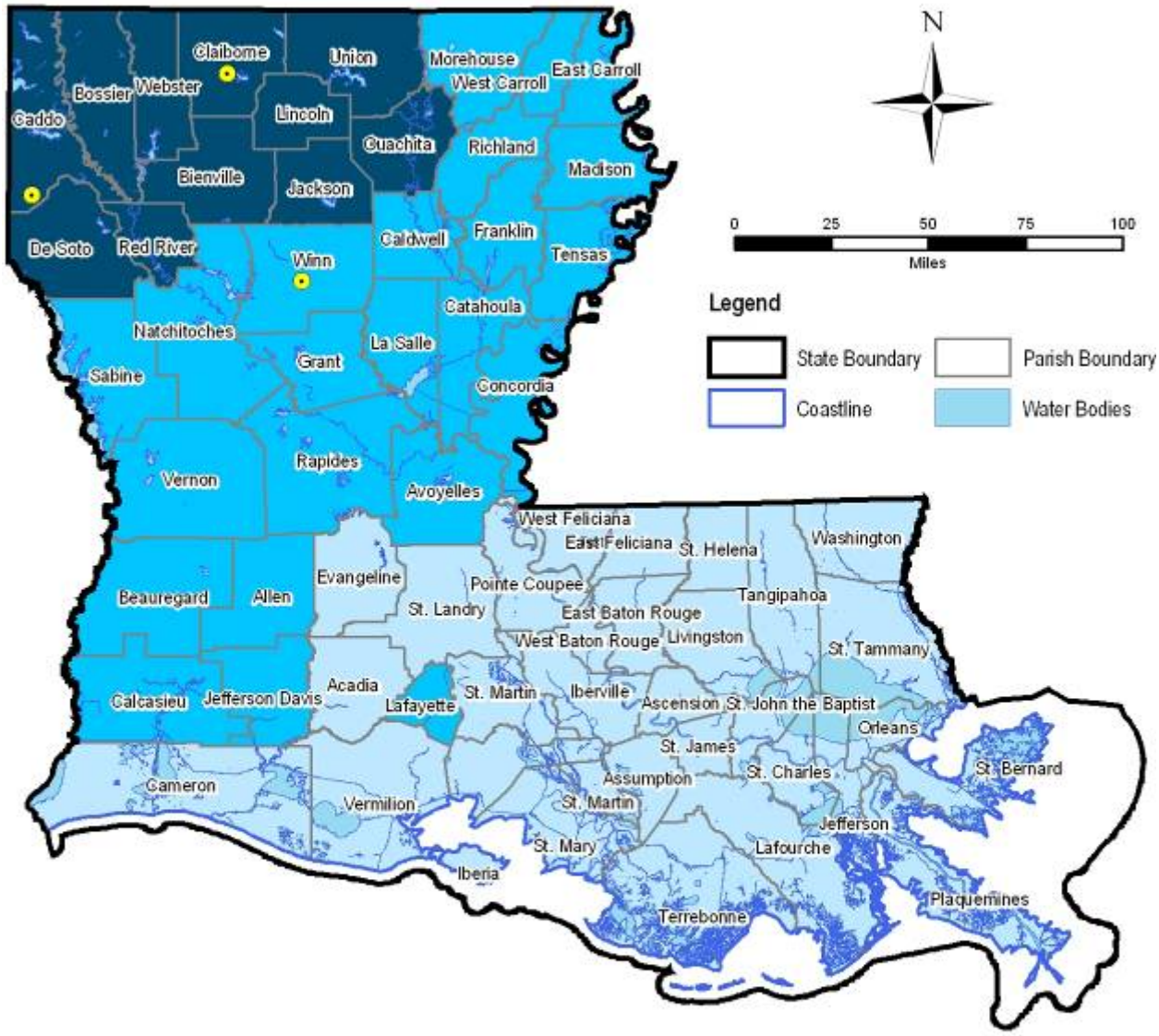
Map F-49: Loss Estimate - Ice Storms - Top Ten



Highest Loss Facilities

Source: Louisiana Facility Management Database

Map F-50: Loss Estimate - Ice Storms - Top 10 - Department of Public Safety and Corrections



⊙ Highest Loss Facilities

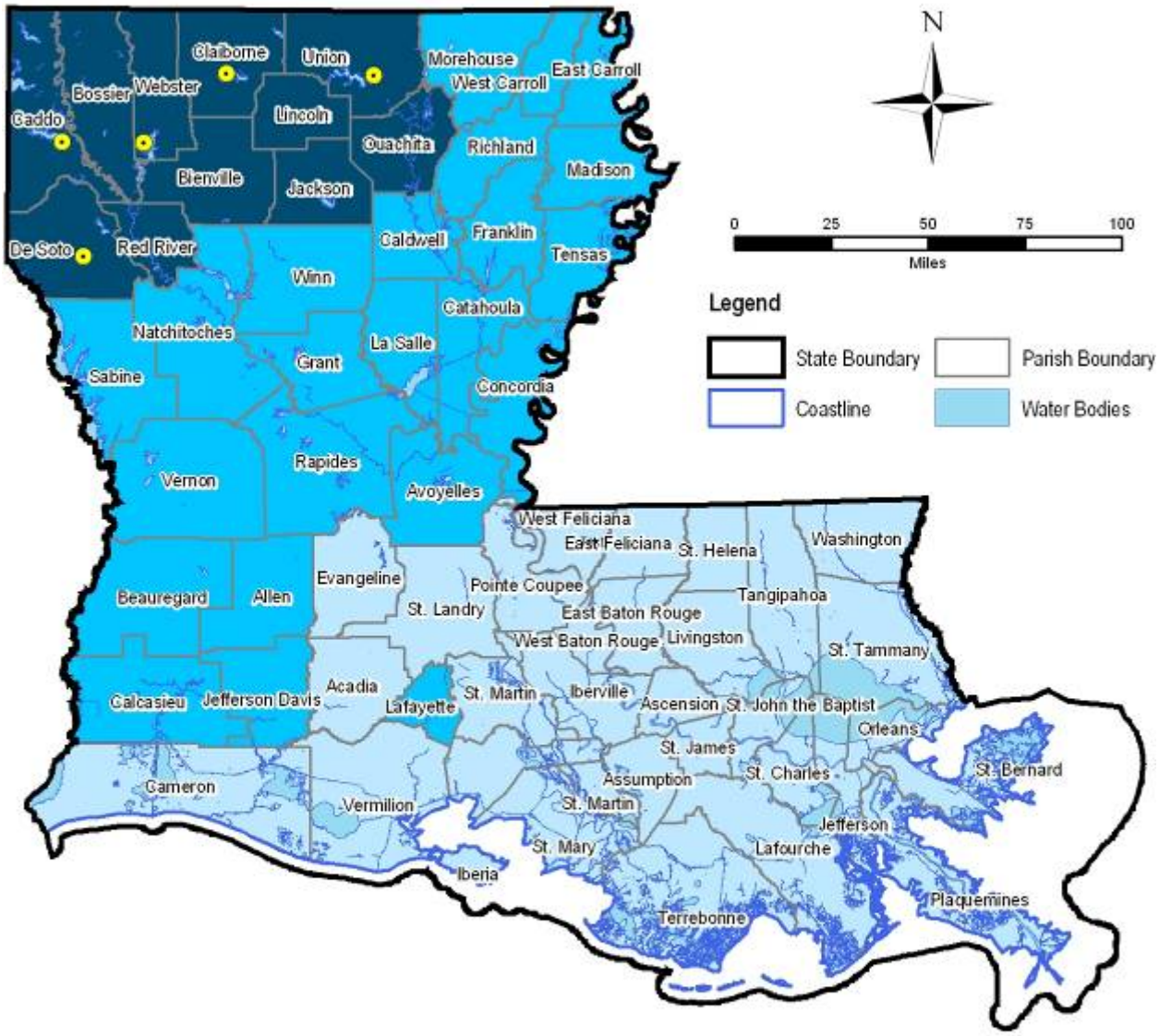
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-51: Loss Estimate - Ice Storms - Top 10 - Department of Culture, Recreation and Tourism



Highest Loss Facilities

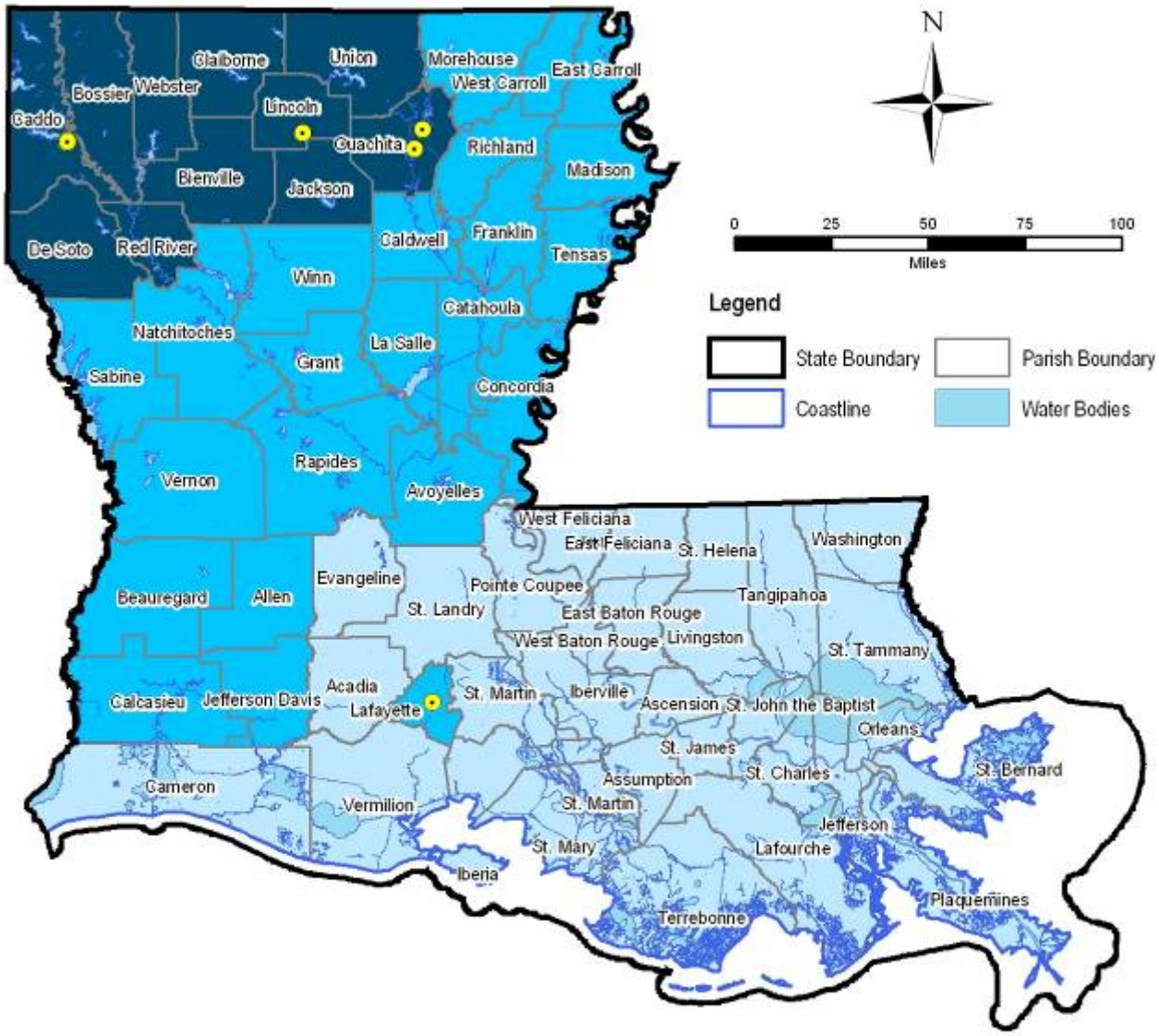
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-52: Loss Estimate - Ice Storms - Top 10 - Department of Education



Highest Loss Facilities

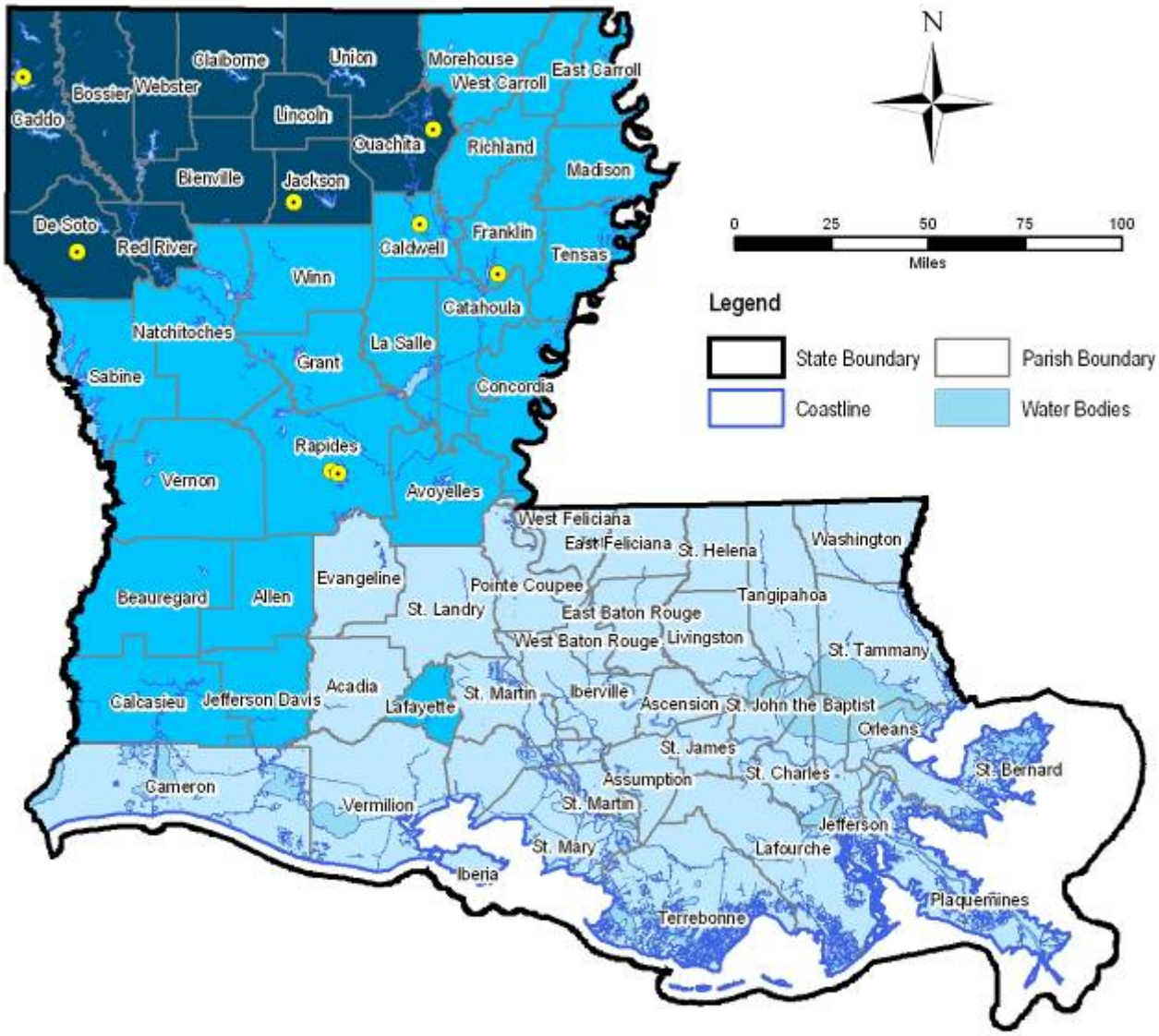
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-53: Loss Estimate - Ice Storms - Top 10 - Elected Officials



Highest Loss Facilities

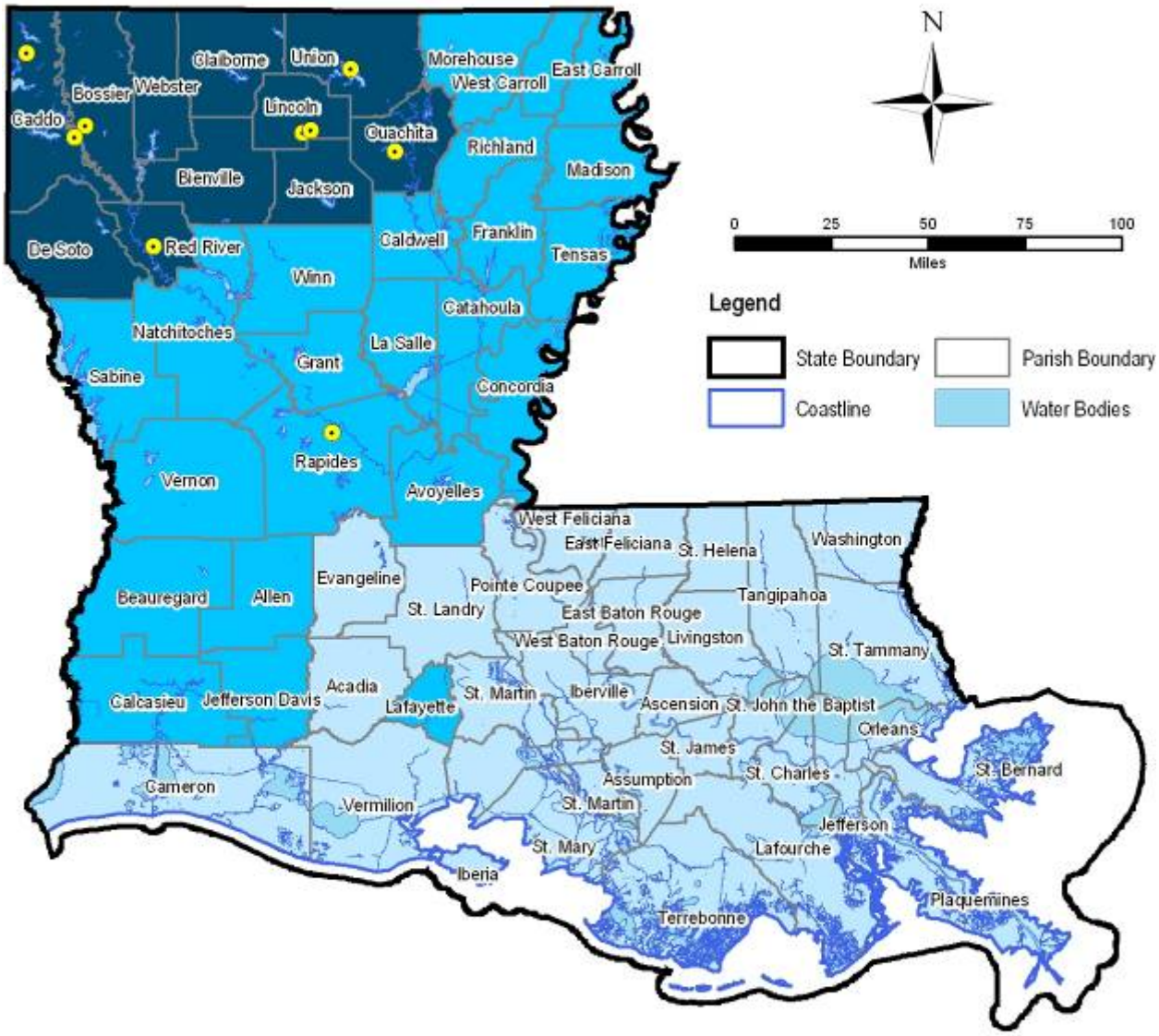
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-54: Loss Estimate - Ice Storms - Top 10 - Executive Department



Highest Loss Facilities

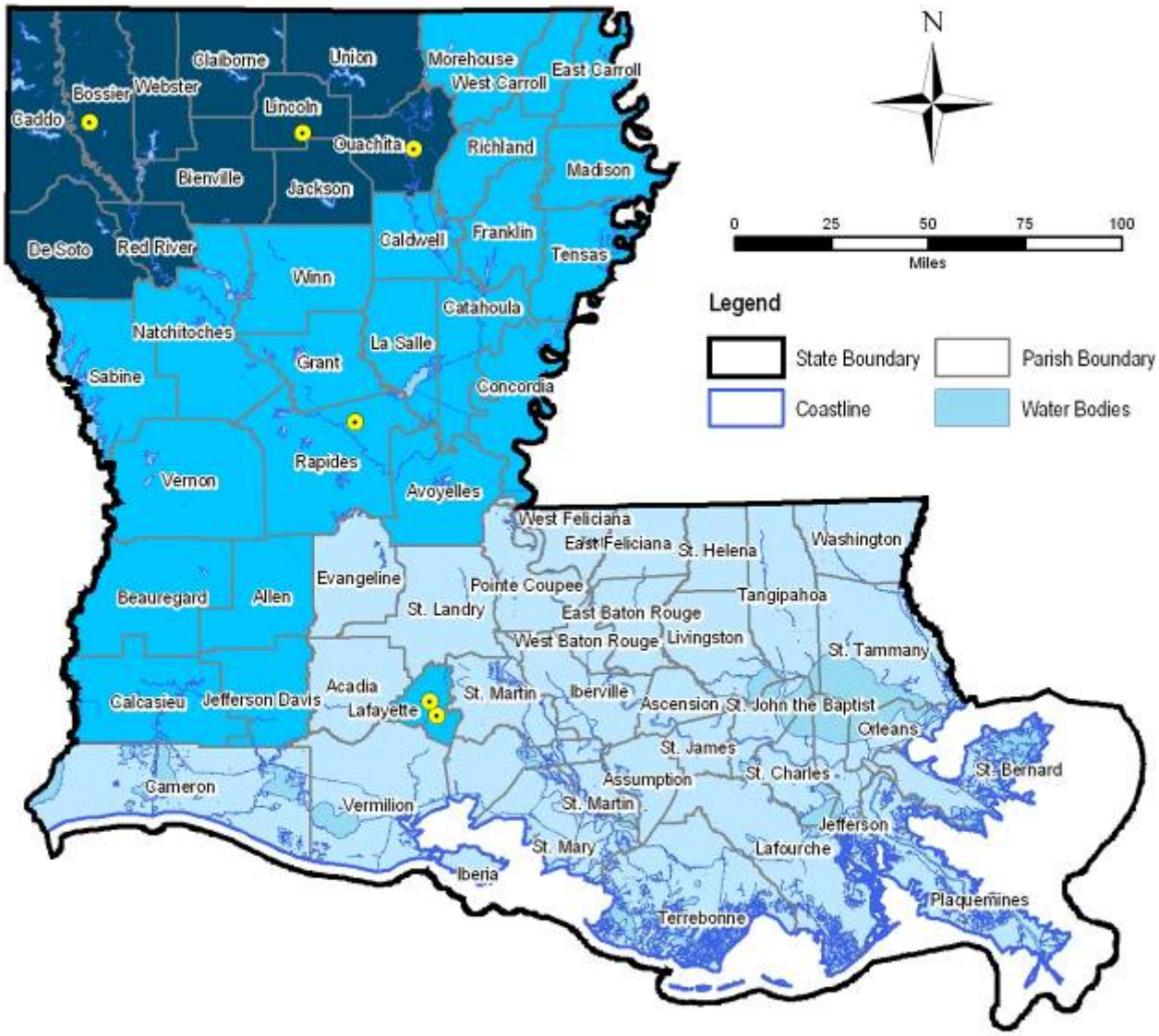
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-55: Loss Estimate - Ice Storms - Top 10 - Department of Health and Hospitals



Highest Loss Facilities

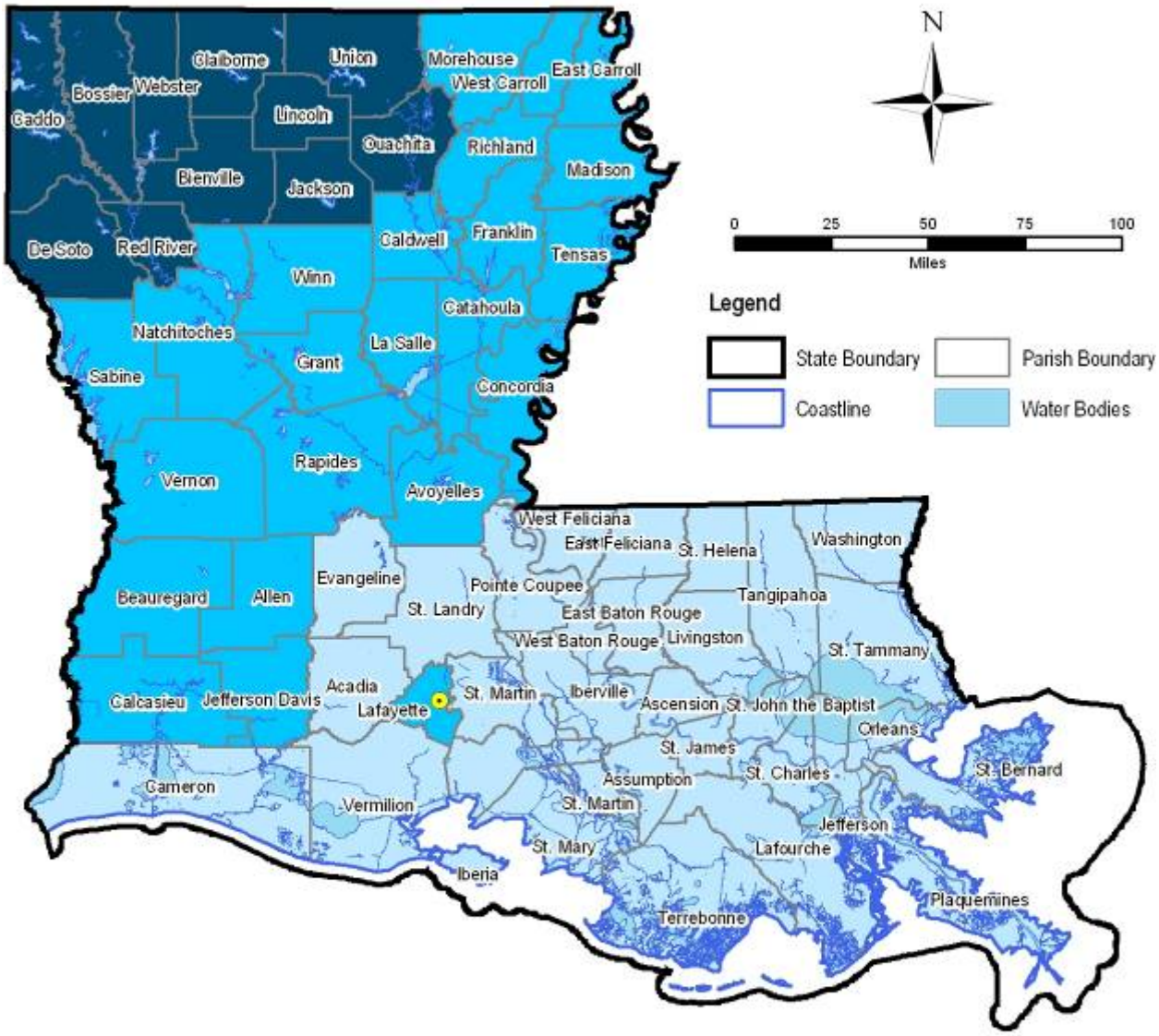
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-56: Loss Estimate - Ice Storms - Top 10 - Department of Labor



Highest Loss Facilities

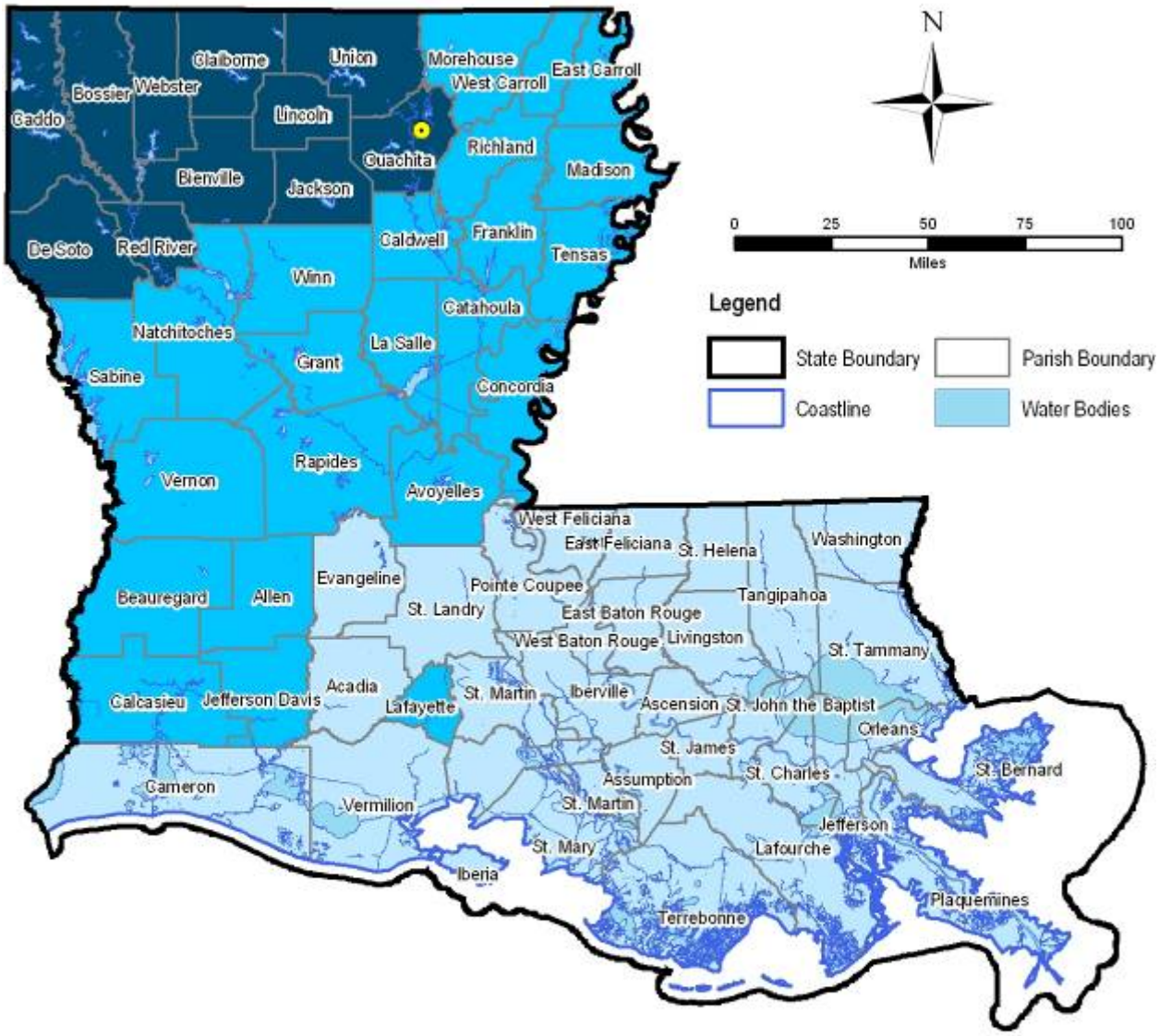
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-57: Loss Estimate - Ice Storms - Top 10 - Other Requirements



Highest Loss Facilities

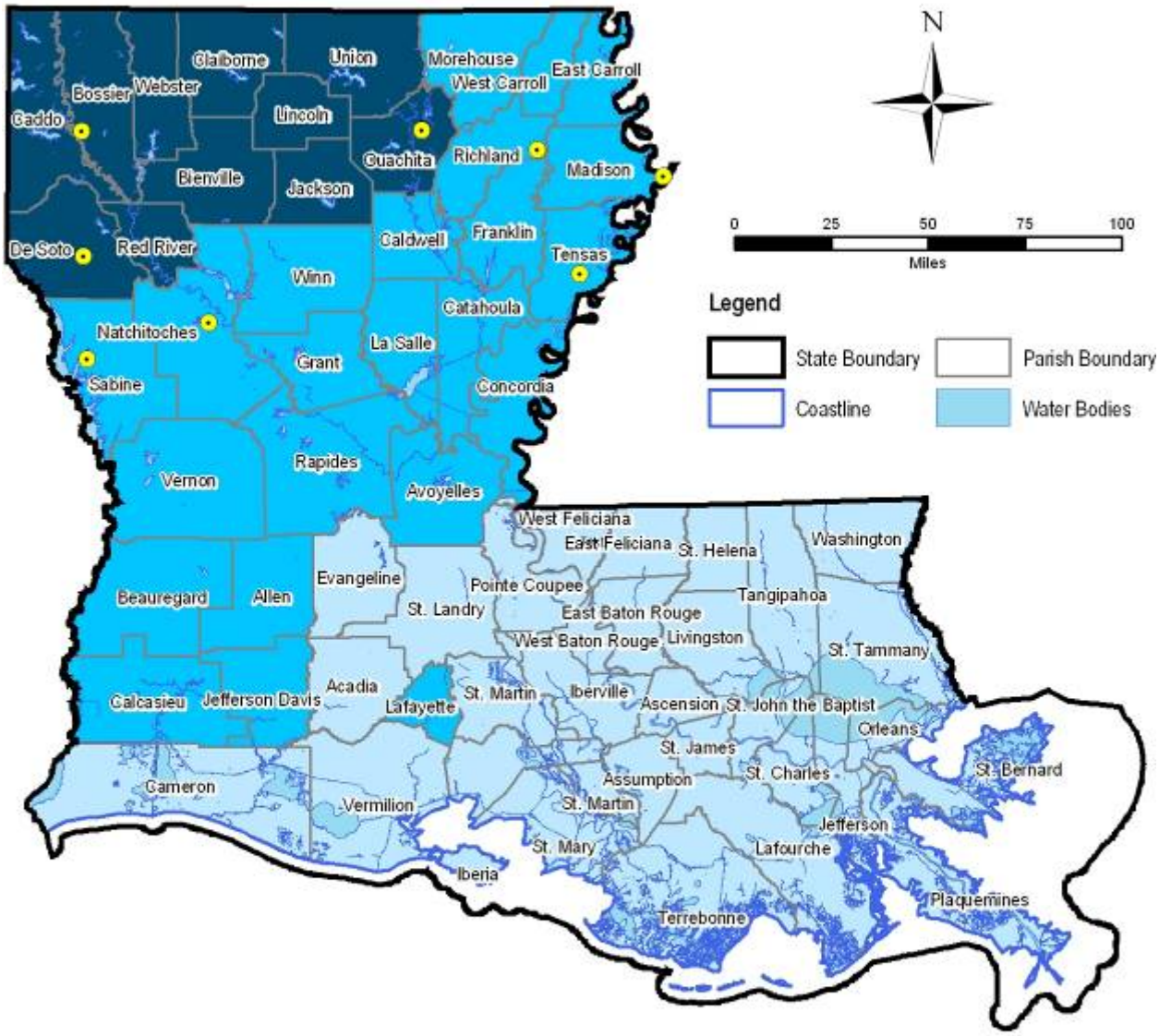
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-58: Loss Estimate - Ice Storms - Top 10 - Department of Transportation and Development



Highest Loss Facilities

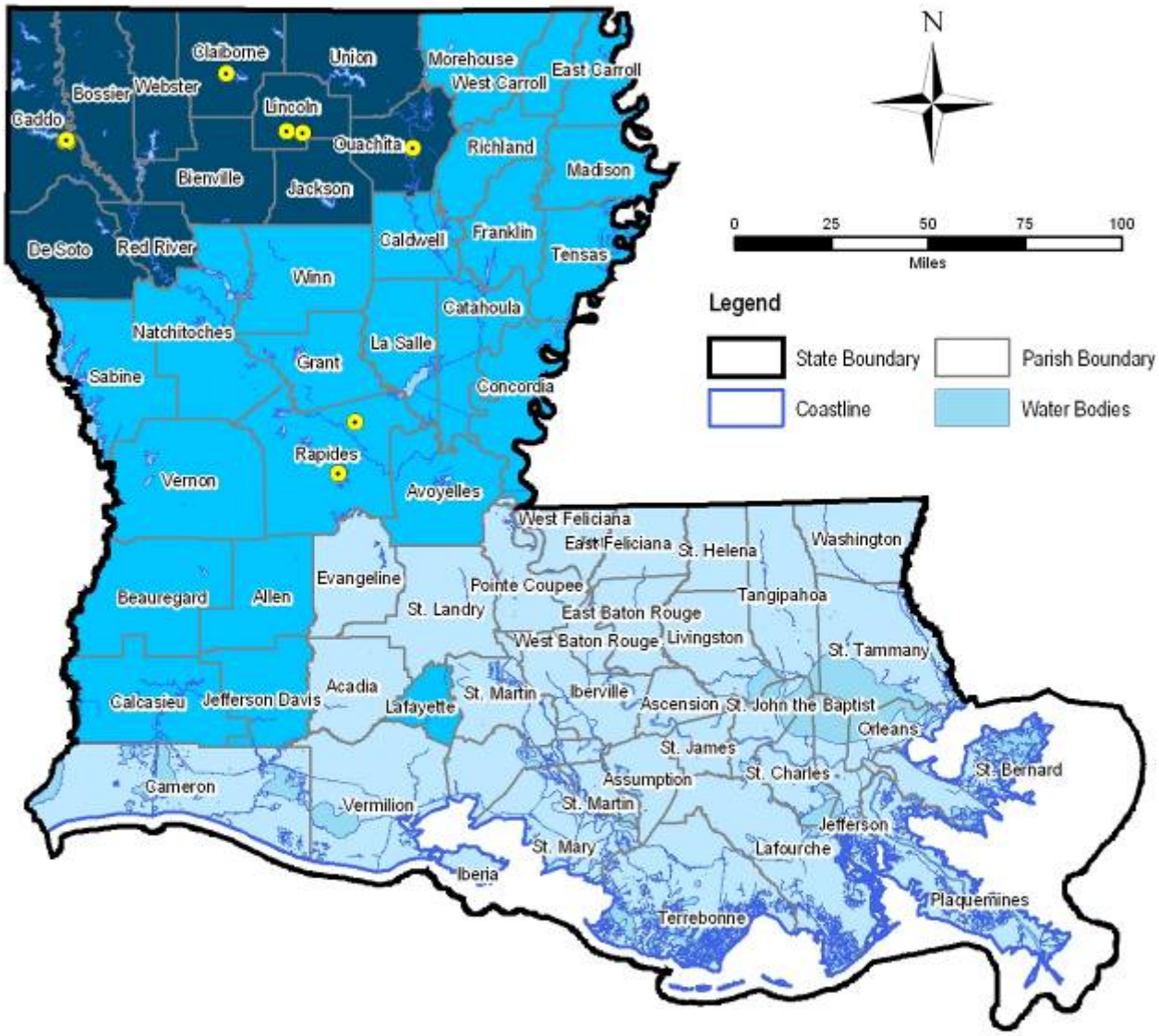
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-59: Loss Estimate - Ice Storms - Top 10 - Unknown Departments



⊙ Highest Loss Facilities

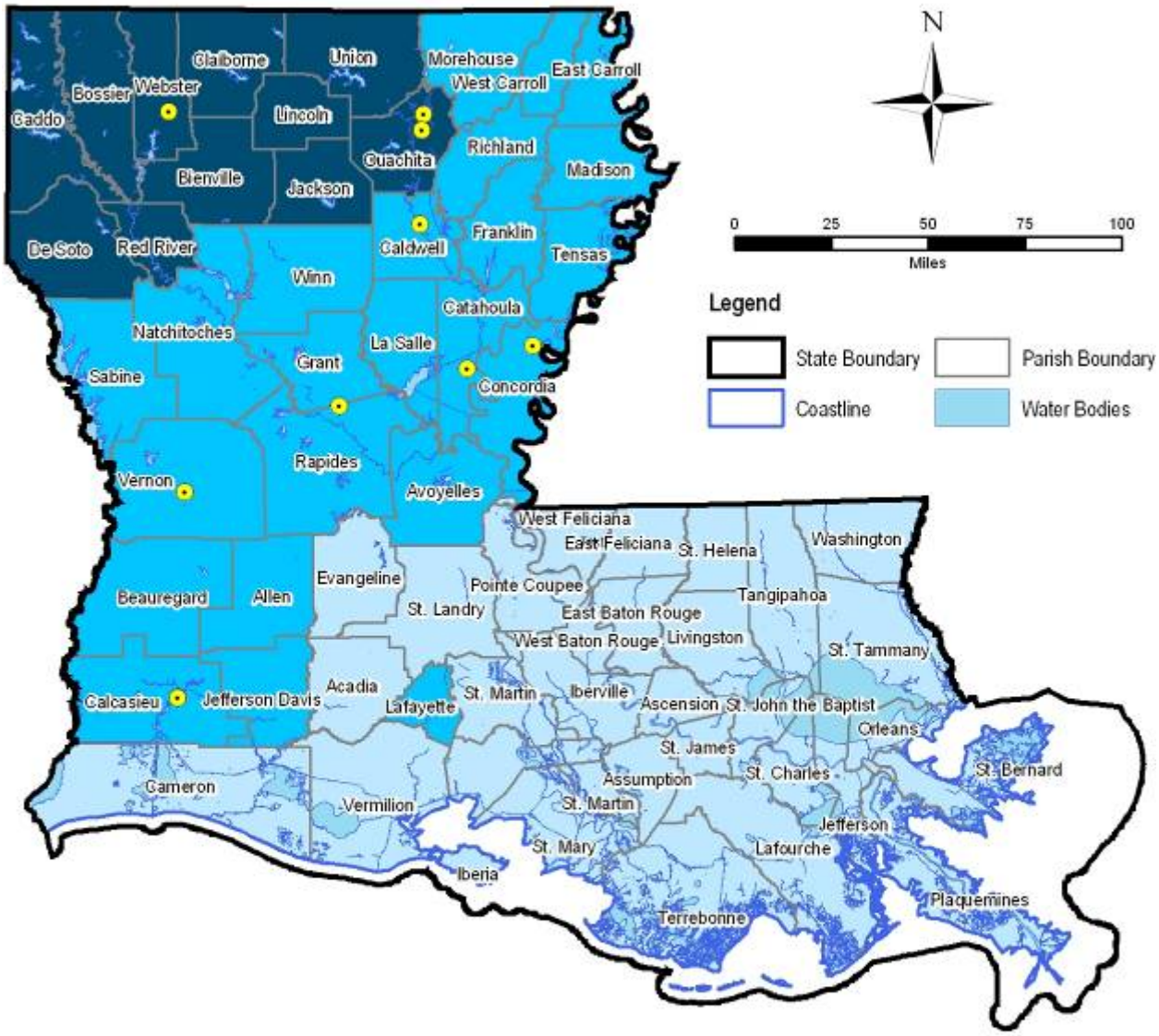
Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA

Map F-60: Loss Estimate - Ice Storms - Top 10 - Department of Wildlife and Fisheries



Highest Loss Facilities

Source: Louisiana Facility Management Database

Previous Ice Storms

No Storms | 1 - 4 Storms | 5 - 10 Storms

Source: NOAA